



ATTACHED TO  
DOSM SEPT 13  
LETTER,  
September 13, 1991

Mr. Don A. Ostler  
Utah Water Pollution Control Committee  
Department of Health  
288 North 1460 West  
P.O. Box 16690  
Salt Lake City, Utah 84116-0690

**SUBJECT: Groundwater Permit for Tailings Pond, Escalante, Utah**

Dear Mr. Ostler:

After receiving your letter of January 31, 1991, we spent considerable time debating how to proceed. We were concerned about the reasons for your decisions, since we believe that the issues raised had been adequately explained in our previous submittal to you. After discussion with our hydrologic and reclamation consultant, we determined that we should address the concerns of the Department again, and from another approach. Accordingly, we commissioned another study to address the issues. A copy of that study is enclosed for your review. We believe that this study verifies the conclusions contained in the reclamation plan: the potential for leaching from the tailings pond is extremely low, but if leaching did occur the impact to groundwater would be small and take thousands of years to move offsite. Thus, we continue to conclude that the probability of occurrence is small and there is a de minimis actual or potential effect on groundwater.

We also believe that we should address each of the five reasons which you used as a basis for not concurring with our previous conclusions. Our responses are as follows:

1. Table 6-8 shows 7 to more than 100 mg/Kg total cyanide in the tailings.

You are correct. The tailings pond was designed to contain the tailings material, including the residual cyanide, and was permitted to be operated and reclaimed in that manner. There have not been any actual releases to the groundwater of which we are aware. A hydrologic consultant was retained in 1984 to investigate whether or not seepage was occurring. That study showed less than a three inch wetting front in the clay liner, while the models used in the current study predict over 8 feet of wetting front. Thus the attached study is very conservative. Further, the wetting front developed before the underdrain system was opened to recycle water. Since the



underdrain system was opened in 1984, there has been very low head on the liner.

The reclamation plan indicates that, based on the design of the facility and actual tests of the foundation of the pond, the potential for the cyanide to migrate from the pond is extremely low. Further, the pond will be capped with a low permeability cover. The water presently contained within the tailings is draining and is being treated, resulting in a very low (essentially zero) head on the tailings pond foundation. (The underflow during operation was about 160 gallons per minute. Presently the underdrain yields about two gallons per minute. We committed in the reclamation plan to maintain the underdrain until the tailings were drained to reduce the water contained in the tailings pond.) Thus, there will be essentially no water remaining in the tailings pond. The net result, as explained in the reclamation plan which your staff has reviewed, is that there will be essentially no potential for cyanide to migrate from the tailings pond.

*- what about when the pond begins to take on water again? How long will this be? will the cyanide values be as high 50-100 years from now?*

2. The water level map, plate 1, shows the hydraulic gradient is toward the Northeast, an irrigated area where the ground water is used for irrigation and for culinary and stock purposes.

The hydraulic gradient in the area is to the east and northeast. However, as pointed out in the text of the reclamation plan, "In the event that any solution originating from the tailings leachate did ever reach the groundwater table, which is about 300 ft below the tailings, a time period of about 4,750 years would be required for this solution to move down-gradient 1,000 feet in the groundwater." Plate 1 also shows that the flat ground, the area which would be irrigated, is about 5-6,000 feet down-gradient. Thus, it would take over 20,000 years for the solution, assuming no attenuation in transit to and with the groundwater, to reach the area which is irrigated. As discussed in the enclosed report, there will be attenuation of cyanide in the soil and water matrix, should the solution in the pond ever penetrate the clay liner under the pond. This report shows, that when absorption is considered, it will take about 35,000 years for solute to reach the groundwater in the irrigated area.

3. Ground water in the mine area contains less than 500 mg/l dissolved solids, and therefore is worth protection.

We do not disagree. We believe that the plan is fully protective of the groundwater. The pond will be capped with a clay material, covered with subsoil and topsoil upon which vegetation will be planted for stability. With the combination of the clay cap and the convex shape of the reclaimed surface, there is little likelihood of infiltration of any consequence into the pond. Further, the underflow from the pond is currently being collected and treated, further reducing the cyanide concentration in the pond. The reclamation plan shows that the cap on the pond will result in only about 0.003 inches of water percolating through the cap per year. Thus, with the tailings moisture content at some point between 30 and 10 percent, it would take 10,000 to 40,000 years



for the tailings in the pond to resaturate.

This issue was addressed again in the enclosed study. The consultant was asked to model the tailings pond under different scenarios. With implementation of the reclamation plan, using different input parameters, and utilizing an inflow through the cap over 25 times as great as in the reclamation plan (i.e., 0.08 inches per year), the HELP model shows that it would take nearly 1200 years to saturate the tailings and another 160 years for the solution to penetrate the clay liner and reach groundwater 300 feet below. This modelling effort shows that the reclamation plan as presented will protect the high quality groundwater.

4. Should cyanide be leached from the tailings pond, insufficient time has elapsed for cyanide to have reached the monitoring wells (p.8). Therefore, we do not know if leakage is occurring.

As noted in the reclamation plan and in the attached study, the calculated time for groundwater to move from beneath the impoundment to the down-gradient monitoring well is about 4,750 years. The solute travel time, due to absorption, would be anticipated to be about 11,400 years. We therefore will not expect to see any migration of cyanide from the tailings pond in any reasonable amount of time.

The best evidence of whether or not leakage is occurring is the study by Fox conducted in 1984. In this study, which was conducted after a period with at least 10 feet of head on the clay liner, showed a three inch wetting front in the two foot thick liner. Since that time, there has been very little head on the liner due to the active underdrain system that had been emplaced on top of the liner. That underdrain system is still active.

5. The HELP model (pages 4 & 5) that you used shows that the cap may achieve tight containment, but it does not leave a stable non-hazardous residual, that at some future date could be released. Therefore, obligation remains with the party that generated the tailings.

We agree that there will be some residual cyanide remaining in the tailings pond. That residual continues to be reduced due to collection and treatment of water from the underdrain system. What the reclamation plan shows, and the enclosed study supports, is that the time period for any remaining cyanide in the pond to migrate from the pond, then migrate to an area off site, is such a long time that the risk is essentially zero.

We recognize that you previously reached a decision that a permit was required for the facility. We have conducted the additional work in an effort to demonstrate our belief that incorrect assumptions were used in reaching that decision. We review the results from modelling, utilizing the same model which I believe your Department uses, and we



cannot visualize an activity that will occur for which permit conditions can be structured. If an event is not likely to occur, what activity can be controlled through permit conditions? Your regulations state that permits must be submitted for facilities which "would probably result in a discharge of pollutants" to the groundwater. What level of probability is used? The likelihood is very small in this case. What permit term will be used? The modelling results show that the solute from the tailings pond, if it does migrate through a compacted clay liner, would not reach the groundwater for many generations and then in an attenuated state.

We are aware that this situation may place an unusual twist on the regulations. We are trying to reclaim a facility rather than operate it. "Modifications" which we would make are not for operation but rather to further reduce the likelihood of contaminant migration from the pond. We have no intention to place contaminants in the pond. It is therefore very difficult for us to accept obtaining a permit for something we are not planning to do or for past activities which our studies indicate are unlikely to cause an impact.

We believe that there must be a mutually agreeable solution to this situation. We have delayed responding because we believe that we should verify and confirm our previous work. We have done that and are now asking you to reconsider your decision. After having reviewed these materials, we would like to meet with you to discuss the possible resolution scenarios. In the meantime, please call if you have any questions.

Very truly yours,



Larry A. Drew  
Manager - Environmental Affairs

LAD:csm

Enclosure

cc: Mack Croft